

### **REMARKS CONCERNING THE AMENDMENTS**

The above amendments were made in an effort to more clearly define the invention. Except with respect to the recitation of the first polymer layer as a coating on the colorant particles and the limitation of the N-containing polymers, the amendments are merely clarifying and are not intended to substantively limit the claims. For example, in reciting the second polymer contained in the organosol having carrier liquid with a Kauri-butanol number less than 30, an organosol has a binder carried (dispersed or suspended in) but not dissolved therein by definition and the carrier liquid was already defined as having a Kauri-butanol number less than 30. The amendments particularly and distinctly point out that the first, pigment surface-treating polymer is a nitrogen-containing polymer derived from polymerizable nitrogen-containing monomer wherein the nitrogen atom is present in an amine group.

Antecedent basis for the amendments may be found generally in the specification and conceptually, for example, page 12, lines 16-24 for coating (precipitation) on the surface of the pigment; the organosol comprising a polymer carried but not dissolved in the carrier liquid with a Kauri-butanol number of less than 30 is shown on page 19, line 6 through page 20, line 17. Antecedent basis for the amendment to an amine functionality of the polymerizable nitrogen-containing monomer is provided in the specification at page 11, lines 3-25 and in original Examples 1-5.

**ISSUES IN THE OFFICE ACTION**

1. Claims 11-12, 14 and 16 have been rejected under 35 USC 102(b) as anticipated by Tsubuko (US Patent No. 4,360,580).
2. Claims 1-5, 11-14 and 16 have been rejected under 35 USC 103(a) as unpatentable over Uytterhoeven et al. (US Patent No. 4,663,265) in view of Baker et al. (US Patent No. 5,698,616).
3. Claims 6-7, 10-13 and 15-16 have been rejected under 35 USC 103(a) as unpatentable over Hou (US Patent No. 5,358,822) in view of Baker et al. (US Patent No. 5,698,616).
4. Claim 8 has been rejected under 35 USC 103(a) as unpatentable over Hou (US Patent No. 5,358,822) in view of Baker et al. (US Patent No. 5,698,616) when further considered with Uytterhoeven et al. (US Patent No. 4,663,265).
5. Claims 6-7 and 9 have been rejected under 35 USC 103(a) as unpatentable over Baker et al. (US Patent No. 5,698,616) in view of Hopfenberg et al. (US Patent No. 3,904,562).

## **ARGUMENTS OF APPLICANTS**

### **Preliminary Remarks**

A brief description of the present invention is thought to be desirable to establish a uniform background for identifying those features of the present invention distinguishing the claimed invention from the prior art.

It was found by Applicants that the stability and performance of liquid electrophotographic toners or inks could be substantially improved. The basis of the problem solved by Applicants was that the toner particles in the ink were unstable and would not form images with maximum possible image densities. The invention found that a pre-treatment of the colorant particles with a first coating resin having a specific range of properties, and then the dispersion of those treated particles in an organosol with a second resin with a different set of properties enhanced the performance of the liquid inks in the electrophotographic process. The important aspect of the invention is the fact that a first resin coats the colorant particles and then the coated particles are dispersed in an organosol with a second and different resin. The use of two resins, one as a particle coating and the other as the organosol binder, and their specific difference in properties act in concert to provide the benefits of the invention. Without the specific differences in properties and their combination with the specific properties associated uniquely with the colorant coating and the organosol binder, the benefits of the invention will not be obtained.

To identify these features, the limitations in amended claim 1 will be pointed out:

1. (CURRENTLY AMENDED) A process of making a liquid ink comprising the steps of:

(a) dissolving a first polymer comprising units derived from at least a nitrogen-containing polymerizable monomer in a solvent with a Kauri-Butanol number greater than 30 to form a polymer solution, wherein said nitrogen atom is present in a functional group selected from the group consisting of amine groups;

(b) dispersing colorant pigment particles in said polymer solution to form a colorant pigment dispersion;

(d) removing at least some of said solvent from said colorant pigment dispersion to form treated colorant pigment particles with an outer layer of the first polymer; and

(d) dispersing said treated colorant pigment particles in an organosol containing a second polymer carried in a carrier liquid having a Kauri-Butanol number less than 30.

Note that as originally filed and claimed, and as merely emphasized by the amendment (substantively limiting the claim only with respect to the fact that the first polymer treatment is a coating), the first polymer is insoluble in the carrier liquid but soluble in liquids having a Kauri-Butanol number greater than 30). This pigment surface treating polymer comprises units derived from at least a nitrogen-containing polymerizable monomer, wherein said nitrogen atom is present in a functional group selected from an amine group (e.g., consisting of primary, secondary, tertiary and quaternary amine groups). The second polymer, contained in the organosol, is dispersed or suspended in the carrier liquid, which has a Kauri-Butanol number less than 30. This combination of properties in the specific order and location recited is the feature that is absent from the teachings in some references used in the rejections as specifically pointed out in the discussion of the rejections.

1. Claims 11-12, 14 and 16 have been rejected under 35 USC 102(b) as anticipated by Tsubuko (US Patent No. 4,360,580).

The rejection asserts that Tsubuko et al show a liquid developer ink (correct) comprising a carrier liquid having a Kauri-butanol number less than 30 (correct), and carbon black surface-treated with polymer obtained from nitrogen containing polymerizable groups such as acrylonitrile, methacrylonitrile, acrylamide, methacrylamide and N-vinyl pyrrolidone deposited from a solvent having a Kauri-Butanol number > 30 (incorrect). Tsubuko neither teaches coating the pigment from a solvent having a Kauri-Butanol number > 30, nor recites the identical

limitation that the nitrogen-containing polymer is derived from polymerizable nitrogen-containing monomers wherein the nitrogen atom is present in an amine functional group (e.g. a primary, secondary, tertiary or quaternary amine group as required by the amended claims.

None of the nitrogen-containing polymers or monomers taught by Tsubuko are in fact amines. Without excluding other arguments that distinguish the claimed invention from the disclosure of Tsubuko et al., this difference alone clearly establishes the novelty of the claimed invention under 35 USC 102(b) with respect to Tsubuko et al. The rejection is in error and must be withdrawn.

2. Claims 1-5, 11-14 and 16 have been rejected under 35 USC 103(a) as unpatentable over Uyterhoeven et al. (US Patent No. 4,663,265) in view of Baker et al. (US Patent No. 5,698,616).

The rejection of these claims is traversed. The basic problem with this rejection is the unique requirement of Uyterhoeven that the two polymeric materials are "chemically reacted" (column 10, lines 5-20). In the present invention, there is no requirement or teaching that the nitrogen-containing polymer used to treat the pigment surface be chemically reacted with the second polymer contained in the organosol. Indeed, because the present invention involves treating the surface of the pigment with a nitrogen-containing polymer dissolved in a solvent having a Kauri-Butanol number > 30 (e.g. carrier liquid insoluble) in a first step, and then combining this treated pigment with a second polymer dispersed in a carrier liquid having a Kauri-Butanol number < 30 in a second step, there is no practical way in the present invention to chemically react the two distinct polymers, which have mutually incompatible carrier solvents.

Moreover, whereas Baker et al. teach a copolymer used to disperse a pigment in a carrier liquid, the copolymer of Baker et al. is itself a graft copolymer formed by chemically reacting a polymer (graft stabilizer) soluble in the carrier liquid (i.e. Kauri-Butanol number < 30) with a monomer (which may be derived from amino-functional groups) which polymerizes to form a carrier liquid insoluble core (i.e. soluble in a liquid with Kauri-Butanol number > 30). This graft copolymer is dispersed in the carrier liquid and combined with a pigment to

produce a liquid toner. However, this polymer, formed by chemically reacting the graft stabilizer and the core, is not itself soluble in liquids having a Kauri-Butanol number > 30, and would thus be unsuitable for the treatment of pigments as described in the present invention. It is therefore impossible to assert that it is obvious to combine the two references without destroying the function of the Uytterhoeven composition to make the coated pigment particles as taught by the present invention and as recited in the claims.

In addition, because the Baker et al. inherently teaches improvements in the sedimentation and aggregation stability of pigments by combining the pigment with an organosol, and Uytterhoeven et al. is directed at itself improving the dispersability and aggregation stability of pigment dispersions in aliphatic carrier liquids, the motivation to combine the Uytterhoeven and Baker et al. references does not exist. Either reference alone teaches an adequate and independent basis for stabilizing the pigment dispersion with respect to aggregation and sedimentation in aliphatic carrier liquids, and attempting to combine the two techniques, because of the above-identified solvent differences, would be difficult. The rejection is in error and must be withdrawn.

3. Claims 6-7, 10-13 and 15-16 have been rejected under 35 USC 103(a) as unpatentable over Hou (US Patent No. 5,358,822) in view of Baker et al. (US Patent No. 5,698,616).

Hou describes the addition of an amide to the surface of the pigment. This is the only material described as useful in the practice of the invention. All claims have been amended to limit the nature of the N-containing polymer as being derived from polymerizable nitrogen-containing monomers wherein the nitrogen atom is present in an amine group, and the limits now exclude polyamides. As the only material described as useful by Hou is an amide and as the claims exclude the use of only an amide, the reference fails to provide an underlying teaching of the coated pigment recited in the claims.

The addition of Baker does not suggest any possible basis for changing the pigment coating required by Hou. As the combination of references still discloses the coating of only amide layers on the pigments, and the claims do not

allow for amide only layers to be the first polymer coating, the presently claimed materials and processes are not obvious from the combination of references.

The rejection is in error and must be withdrawn.

4. Claim 8 has been rejected under 35 USC 103(a) as unpatentable over Hou (US Patent No. 5,358,822) in view of Baker et al. (US Patent No. 5,698,616) when further considered with Uytterhoeven et al. (US Patent No. 4,663,265).

As noted above, the combination of Hou in view of Baker fails to teach the limitations of the claims from which claim 8 depends. The citation of Uytterhoeven not only fails to overcome that underlying deficiency, but as noted above in (2), Uytterhoeven tends to specifically teach away from the present invention. The rejection is in error and should be withdrawn.

5. Claims 6-7 and 9 have been rejected under 35 USC 103(a) as unpatentable over Baker et al. (US Patent No. 5,698,616) in view of Hopfenberg et al. (US Patent No. 3,904,562).

It must be remembered that there are specific process limitations in these claims. Even before amending, the claims required dissolving a first polymer, and dispersing a pigment in that polymer, precipitating the first polymer on the pigment as a treatment, and then dispersing the treated polymer in an organosol, with both the first polymer and the solvent and the carrier liquid having specific properties (solubility in the solvent, a Kauri-Butanol number greater than 30, and a Kauri-Butanol number less than 30, respectively). These features are emphasized in claim 6, reproduced below.

6. (CURRENTLY AMENDED) A process of making a liquid ink comprising the steps of:

(a) dissolving a first polymer comprising units derived from at least a nitrogen-containing polymerizable monomer in a solvent with a Kauri-Butanol number greater than 30 to form a polymer solution, wh rein said nitrogen atom is present in a functional group selected from the group consisting of amine groups;

- (b) dispersing colorant pigment particles in said polymer solution to form a colorant pigment dispersion;
- (c) precipitating treated colorant pigment particles from said colorant pigment dispersion, the treated colorant pigment comprising pigment with said first polymer precipitated thereon; and
- (d) dispersing said treated colorant pigment particles in an organosol containing a second polymer suspended in a carrier liquid having a Kauri-Butanol number less than 30.

Baker is not even asserted in the rejection to show these combinations of steps, and neither Baker nor the combination of Baker and Hopfenberg teach these steps in combination with the specifically recited properties.

The rejection is clearly insufficient and must be withdrawn.



**CONCLUSION**

All rejections have been overcome by amendment and/or argument, or were in error as originally stated. All claims are now in condition for allowance.

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